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COLLARD & ROE, P.C. 1077 NORTHERN BOULEVARD ROSLYN, NY 11576			EXAMINER ETHERTON, BRADLEY	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/583,572	Applicant(s) KOWOLL ET AL.	
	Examiner Bradley Etherton	Art Unit 1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 6-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 6-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 27, 2010 has been entered.

Claims 1-3 and 6-11 are pending in the application. Claims 4-5 have been cancelled. New claim 11 is acknowledged.

Response to Amendment

The previous 35 USC 103 rejections of claims 1-3 and 6-10 are withdrawn in view of Applicants' amendments. The previous 35 USC 103 rejections of claims 4-5 are considered moot in view of the cancellation of claims 4-5.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Hashimoto**, et al. (U.S. 4,350,665), in view of **Dunster**, et al. (U.S. 4,865,820).

In regard to claim 1, **Hashimoto** discloses a reactor which is useful for conducting gas phase catalytic reactions which require good gas mixing (Abstract). The reactor is effective for mixing streams of hydrocarbon and air before they contact a catalyst (col. 4, line 49 to col. 5, line 18). Therefore, the reactor is considered suitable for conducting reaction involving oxidations, e.g., partial oxidation reactions or oxy-

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dehydration reactions. The reactor is designed as follows (col. 2, line 44 to col. 4, line 25:

(a) The gas mixture flows axially through the reactor.

(b) A gas distributor is mounted directly above the catalyst bed. The gas distributor is a circular pipe with multiple perforations or multiple nozzles. In the examples, the velocity of the air ranges from 46.5 to 63 m/sec (col. 4, lines 49-55). Therefore, the flowing gas is considered to correspond to a jetting gas stream. The distance between the gas distributor and the catalyst bed is at least $0.18 \times ID$, where ID is the internal diameter of the reactor. $0.18 \times ID$ is the sum of $0.06 \times ID$ (section II shown in Figure 9A and col. 3, lines 24-28) and $0.12 \times ID$ (section III shown in Figure 9A and col. 3, lines 52-55). **Hashimoto** is silent regarding the internal diameter of the reactor.

(c) The perforations are located at different points around the circumference of the gas distribution pipe (Figure 4). The gas stream from the gas distributors is preferably directed at angles ranging from 90° to 135° relative to the axis of the reactor (col. 3, lines 4-13).

(d) More than one gas distributor may be used to distribute the gas. **Hashimoto** discloses that vertical separators are located between the individual gas distributors.

(e) The gas distributor may be a circular pipe equipped with nozzles or perforations (Figure 7C). In the case of a circular distributor, **Hashimoto** discloses an example in which three vertical separators are used (Figure 6C). Since three vertical separators would be used to separate two or three circular distributors, **Hashimoto** is

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considered to disclose a gas distributor comprised of multiple, i.e., plural, concentric rings.

(f) Flow from the circular distributor may be radially inward (Figure 7C).

(g) A gas dispersing plate may be located between the gas distributor and the catalyst bed in order to provide additional mixing before the gas contacts the catalyst.

Hashimoto discloses that the gas dispersing plate is not required and provides an example in which the reactor is operated without the plate (col. 5, lines 3-5).

Hashimoto does not appear to explicitly disclose (1) that the process in the reactor is an oxy-dehydration process, (2) jetting the air stream directly onto the catalyst at an inclined angle, and (3) jetting the oxygen in a plane 50-300 mm above the catalyst bed and that the dwell time is < 1 sec in the space above the catalyst bed.

However, **Dunster** discloses a catalytic partial oxidation process and an apparatus for mixing and distributing gas streams in the reactor (col. 1, lines 6-11). The gas streams, which contain air and hydrocarbon, are considered to be equivalent to the air/hydrocarbon gas streams disclosed by **Hashimoto** and partial oxidation is considered to be equivalent to oxy-dehydration. The process involves the following:

(a) A cylindrical reactor which contains beds of monolithic partial oxidation catalyst. Gases enter the reactor through inlets #66 and #70, so axial flow through the catalyst beds is considered to occur (Figures 1 and 5)

(b) An oxidant flows through a series of parallel nozzles directly toward the catalyst surface. The oxidant may be air or a mixture of steam and air. **Dunster** discloses that velocities through the nozzles should exceed the flashback velocity for

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combustion of the hydrocarbon/air mixture. The velocities range from 6 to 55 m/sec, which are in the velocity range disclosed by **Hashimoto** discussed above.

(c) Mixing of the gases occurs because the flow is turbulent (**Dunster**, Abstract).

In regard to directing the flow toward the catalyst, **Dunster** discloses that the flow is directed onto the catalyst surface. Although **Hashimoto** discloses directing the flow parallel to the catalyst surface in order to provide time for the gases to mix before contacting the catalyst. However, **Hashimoto** also discloses gas velocities that are greater than those disclosed by **Dunster**. Therefore, the jets produced by the circular distributor are considered to be turbulent jets that are even more effective for mixing gases. Since **Dunster** discloses that adequate gas mixing for a partial oxidation reaction occurs when two gases are brought into turbulent contact (**Dunster**, Abstract), the nozzles of **Hashimoto** are considered to produce acceptable gas mixing for partial oxidation whether the flow is directed parallel to the catalyst surface or onto the surface as taught by **Dunster**.

In regard to the inclination of the nozzles, **Hashimoto** discloses locating multiple rows of nozzles positioned at different angles on the gas distributor pipe (col. 3, lines 4-12). While one row may produce jets which are perpendicular to the surface of the catalyst, the other rows will produce jets that are inclined relative to the catalyst surface. Arranging the gas distributor so that only those nozzles that produce jets at an incline are used is considered to be rearranging existing parts of the gas distributor in order to optimize the process. It is well settled that the rearrangement of parts has no

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patentable significance unless a new and unexpected result is produced. See MPEP 2144.04, Sec. VI.

In regard to the height of the distributor above the catalyst surface, **Dunster** discloses a reactor with a diameter of 0.91 m (col. 7, lines 18-21). Therefore, the gas distributor should be located at least 163.8 mm above the surface of the catalyst bed (0.18ID). Since a range of 163.8 mm and greater above the catalyst bed falls in the range of 50 to 300 mm above the catalyst bed, the range recited in claim 1 is considered *prima facie* obvious.

In regard to the dwell time in the space above the catalyst bed, the dimensions and flow rates disclosed by **Dunster**, which are considered typical for oxy-dehydration reactors are as follows (col. 7, lines 11-20):

(a) The distance between the nozzles and the catalyst bed is 0.163 m.

(b) The diameter of the space is 0.91 m.

(c) The total flow rate of gases through the reactor is about 2.8 m³/sec.

Therefore, the dwell time in the gap is about 0.04 sec. Since a dwell time of 0.04 sec falls in the range less than 1 sec, the range recited in claim 1 is considered *prima facie* obvious.

Therefore, at the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the reactor with circular gas distributor as taught by **Hashimoto** and utilize a partial oxidation catalyst and direct the flow of the oxygen-containing gas downward toward the catalyst as taught by **Dunster** because (i) flow of oxygen in the direction of the catalyst is a known means for effectively bringing oxygen

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into contact with a partial oxidation catalyst and (ii) turbulent gas flow is an effective means for avoiding flashback and for mixing the reactant gases (**Dunster**, col. 2, lines 40-48).

In regard to claim 2, **Hashimoto** discloses an example in which the jetting is toward the center of the reactor (Figure 7C).

In regard to claim 3, **Hashimoto** discloses that the gas may be blown in the centripetal direction, i.e., tangentially to the reactor wall (col. 1, lines 39-42).

Hashimoto also provides an example of a gas distributor in which the gas is blown tangential to the reactor wall (Figure 7B). As discussed above, each of the concentric ring distributors has multiple rows of nozzles on the pipe (Figure 4). Therefore, each circular distributor pipe is considered to have nozzles which blow gas in alternating alignments. Arranging the gas distributor such that jets are produced by only those nozzles that alternate in flow direction corresponds to rearranging the existing parts of the gas distributor in order to optimize the process. It is well settled that the rearrangement of parts has no patentable significance unless a new and unexpected result is produced. See MPEP 2144.04, Sec. VI.

In regard to claim 11, **Hashimoto**, in view of **Dunster**, discloses a reactor comprised of a catalyst bed and a gas distributor pipe, as discussed above. As also discussed above,

(a) The gas distributor may be comprised of more than one concentric ring.

(b) The distribution pipes have a series of perforations or nozzles. An oxygen-containing gas is jetted through the nozzles.

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(c) The gas distributor is located above the catalyst bed.

(d) Largely axial flow of the gas mixture occurs through the catalyst bed

(e) The perforations may blow the oxygen-containing gas onto the catalyst surface. The perforations/nozzles are located around half of the circumference of the pipe. Therefore, when the central perforations are directed straight at the catalyst surface, most of the jets are at an angle inclined away from the vertical.

(f) The overall reactor dimensions and flow rates are such that the gas distributor is positioned in a plane at least 163 mm above the catalyst bed and the oxygen dwell time is about 0.04 sec. Since (1) a range of at least 163.8 mm above the catalyst bed falls in the range of 50 to 300 mm above the catalyst bed and (2) a dwell time of 0.04 sec falls in the range less than 1 sec, the ranges recited in claim 11 are considered *prima facie* obvious.

In regard to claim 7, **Hashimoto** discloses that the jets may be directed toward the center of the reactor, as discussed above.

In regard to claim 8, **Hashimoto** discloses that the nozzles may be located at different positions around the circumference of the pipe, as discussed above.

Hashimoto further suggests that the spacing between adjacent nozzles may change along the length of a distributor pipe (Figures 4 and 2). Therefore, each circular distributor pipe is considered to have adjacent nozzles which blow gas in different directions. Arranging the gas distributor such that adjacent nozzles produce jets that flow in different directions is considered to correspond to rearranging the existing parts of the gas distributor in order to optimize the process. It is well settled that the

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rearrangement of parts has no patentable significance unless a new and unexpected result is produced. See MPEP 2144.04, Sec. VI.

In regard to claim 10, **Hashimoto** discloses that the gas may exit the distributor through perforations, i.e., holes, or nozzles, as discussed above.

In regard to claim 9, **Hashimoto** discloses that each of the concentric ring distributors has multiple perforations around the pipe circumference, as discussed above. Therefore, nozzles which blow gas in alternating alignments are considered to be present. Arranging the gas distributor with only those nozzles that produce jets that alternate in flow direction is considered to be rearranging existing parts of the gas distributor in order to optimize the process. It is well settled that the rearrangement of parts has no patentable significance unless a new and unexpected result is produced. See MPEP 2144.04, Sec. VI.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Hashimoto**, in view of **Dunster**, as applied to claim 11 above, and further in view of **Zardi** (U.S. 4,372,920).

In regard to claim 6, **Hashimoto**, in view of **Dunster**, discloses the reactor of claim 11, as discussed above, but does not appear to explicitly disclose that the reactor further comprises (c) a central gas inlet pipe which centrally penetrates the catalyst bed and (d) has a mixing dome above the catalyst bed and that the ring distributor surrounds the central gas inlet pipe.

However, **Zardi** discloses a reactor for conducting heterogeneous catalytic reactions involving gaseous reactants (Abstract). The reactor is designed as follows:

(a) A central gas inlet pipe leads from the bottom of the cylindrical reactor to the top of the reactor. Therefore, the central inlet pipe introduces the gas feeds from the bottom of the reactor rather than from the top of the reactor as taught by **Hashimoto**.

(b) The top of the reactor is closed with a dome. Gas flows the length of the inlet pipe, contacts the dome, and flows in the opposite direction. Therefore, the dome is considered to correspond to a mixing dome.

(c) One or more modular catalyst cartridges, i.e., catalyst beds, surround the centrally located inlet pipe. Therefore, the pipe is considered to penetrate the catalyst beds.

In regard to the location of the circular gas distributors, **Hashimoto** discloses that these distributors are located about the central axis of the reactor. Therefore, the circular gas distributors are considered to surround any central gas inlet pipe that penetrates the catalyst bed and passes to the top of the reactor.

Therefore, at the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the reactor of **Hashimoto**, in view of **Dunster**, and substitute the central inlet pipe and closed dome of **Zardi** for the upper feed inlet taught by **Hashimoto** because (i) it involves the simple substitution of a known reactor design that is effective for introducing the reactant gases and (ii) the design of **Zardi** offers a simple internal structure that is easily accessible for maintenance and offers limited pressure drop (**Zardi**, col. 2, lines 14-19).

Response to Arguments

The Examiner notes that Applicants' main arguments present in the Remarks filed on July 27, 2010 may be summarized as follows:

(a) That the **Vanderborgh** (U.S. 2002/0098136) reference teaches "a parallel overcurrent" of oxygen rather than a gas flow which contacts the surface at an angle inclined from the surface normal.

(b) That **Vanderborgh** teaches introducing a gas that flows perpendicularly to the flow path of the first gas introduced into the reactor.

(c) That the **Vanderborgh** reference does not teach the use of a gas distributor comprised of a concentric circular rings as recited in amended claims 1 and 11.

The Examiner has carefully considered these arguments and finds them persuasive. Therefore, the previous 35 USC 103 rejections have been withdrawn.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

(a) **Korin**, et al. (U.S. 2,632,692) discloses a reactor comprised of multiple catalyst beds in which gas is distributed via a circular gas distributor.

(b) **Lionetti**, et al. (U.S. 4,443,551) discloses a gas distributor in which the alternating nozzles direct gas jets in different directions.

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(c) **Pratt**, et al. (U.S. 4,595,145) discloses a gas distributor in which the alternating nozzles direct gas jets in different directions.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bradley Etherton whose telephone number is (571) 270-5478. The examiner can normally be reached on Monday through Friday, 7:30 a.m. to 5:00 p.m. EST, with alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bradley Etherton/
Examiner, Art Unit 1771

/Glenn A Caldarola/
Supervisory Patent Examiner, Art
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